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EDITORIAL NOTES

GAS INDUSTRY DEVELOPMENT

IN a speech at Leeds last Friday, Mr. E. V. Evans, President of The Institution of Gas Engineers, referred to a subject necessarily affecting everyone in the Gas Industry—namely, its future development. How many of us, he remarked, have proved that if gas, or gas and coke, be used for the complete heating of the domestic house, and the method of charge is a well planned one, the fuel bill is substantially the same as if raw coal were used. Could we, in fact, need greater encouragement? The previous day Dr. E. W. Smith, Director-General of Gas Supply, addressing members of the Wales and Monmouthshire Association, spoke of the Industry as a great coal-processing industry holding out untold possibilities easily capable of ultimate fulfilment through evolutionary reorganization from within. The comments of both Mr. Evans and Dr. Smith are reported later in to-day's "JOURNAL," and to our mind they are apposite to thoughts on the two Institution Papers by Mr. E. Crowther and Dr. Harold Hartley which we have printed practically in full in our pages.

Mr. Crowther gave an account of the results of an uncompromising "all gas" heating policy adopted by the Newcastle Company six years ago—a policy which, he said, has been fully justified by all the evidence so far accumulated. Detailed records of 200 typical examples of all-gas houses in the district show the annual average consumption of "useful" therms to be 316; and the annual cost of the gas consumed (pre-war prices) is strictly comparable with the fuel costs in similar dwellings heated by earlier methods. This result has been accompanied by satisfaction of two of the paramount demands of the nation in regard to fuel utilization—the betterment of public health (including the disappearance of the domestic smoke evil) and the avoidance of waste of fuel resources. The Newcastle method of charge was well planned, and the outcome exemplifies Mr. Evans' statement mentioned above. It also led Mr. Crowther to the suggestion that in post-war building the gas equipment should be regarded as an integral part of the fabric, should be supplied by the landlord, and recovered in the rental. It is, however, the method of charge which we would stress at the moment, because a high consumption per consumer figure should make possible the supply of gas at such rates that total fuel bills are comparable with those obtaining with raw coal. How far this would hold universally without the sale of coke we do not know. It may be that the Gas Industry should present a smokeless fuel case rather than an "all gas" case for universal application. The Industry must be able to implement its advice.

It is obvious that what we want is a low commodity rate for gas. Regarding this Mr. Evans last week put forward some highly interesting and significant figures, the principle underlying which should be borne in mind. He took the cost of "servicing" a domestic consumer as averaging about £2 10s. a year—which is 600 pence. If a consumer uses 100 therms of gas a year, the service cost of that gas is 6d. a therm. If the actual cost of the gas is taken as 4d. a therm, then he pays 10d. a therm. If he uses 200 therms, he pays 7d. a therm; if he uses 300 therms (compare Mr. Crowther's figure), he pays 6d. a therm. When gas can be sold at 6d. a therm it ceases to be a luxury fuel and falls into a class able to displace raw coal. On the other hand, if the consumption per consumer falls to 50 therms per annum, then the final price to the consumer is 1s. 4d. a therm. Unless, said Dr. Hartley in his Paper, gas can be supplied to the domestic user at a low commodity rate, the Industry will stagnate.

Mr. Evans suggested that development of the Industry would be no simple matter because appliances using raw coal are from year to year being improved. Now we agree with Dr. Hartley that the whole question of the domestic use of fuel bristles with difficulties and complications, and it is probable there is no single solution of the domestic heat service problem which is likely to be adopted universally quickly; but gas and coke can in fact satisfy the needs of all; they could satisfy the requirements of most people; and the domestic use of raw coal in new houses should be recognized as socially intolerable. "It is," he said, "in the development of the solid fuel appliances that the most rapid progress is being made at present," and he added that after the war there will be an increased demand for coal or coke ranges which can be kept alight day in and day out. It seems to us that he almost went out of his way to disparage the use of gas for water heating. He pictured conditions where it was necessary to depend on a gas copper or an instantaneous heater delivering a mere trickle of hot water—conditions which would not encourage the taking of hot baths. We are quite at a loss to understand the implied indictment of the instantaneous gas water heater, and consider that any development policy which ignored the many advantages of this most flexible and economical appliance would be mistaken. It is all to the good that smokeless solid fuel appliances should be improved—Dr. Hartley spoke of coke fires (and coal fires) which would be obtainable after the war giving an effective efficiency of 60% and suitable for continuous 24-hour per day use. But there is a flexibility about gas both for heating and for water heating which ought not to be lightly dismissed, and it does not follow that the price of gas service must be as low as that for coal. There are hundreds of thousands of consumers who would willingly pay an extra shilling or two per week to have all the advantages of fuel on tap; and the cost of gas can be kept low by a judicious combination of gas and coke. There must be a balancing of factors, and we think that the Industry should be in a position to determine this balance and to give guidance to individual gas undertakings regarding gas and coke usage. There is real need for direction. Load factor—as the electricity industry appreciates better than we do—is important. If solid fuel (coal or coke) were to be adopted to any large extent for cooking in place of gas, gas load factor would be seriously affected. Would, however, many of the 8 million or thereabouts housewives now using gas for cooking want to return to solid fuel? Is it possible that the developments in solid fuel appliances predicted by Dr. Hartley will result in the Gas Industry coming to the conclusion that perhaps the right course would be to consider gas as a by-product of carbonization? Are all the straws pointing in the direction of far greater solid fuel usage in the home? Is it impossible for the Gas Industry to indicate clearly where gas and where coke have special advantages, and how the supply position favours one or the other where both are suitable?

Personal

Retirement of Mr. J. W. Napier

After forty years' service to the Alloa Corporation as Gas Engineer and Manager, Mr. J. W. Napier, O.B.E., who during this period has engaged in widespread activity on the Gas Industry's behalf, has retired, though he still preserves a considerable interest in a number of company undertakings, being Chairman of several companies in Scotland. His career is, in fact, one of quite remarkable activity. He was President of the Waverley Association of Gas Managers in 1912, and of the North British Association of Gas Managers in 1929.

Mr. Napier received his early training under his father, Mr. Andrew Napier, at the Crieff Gas-Works. He was a student of the Heriot Watt College, Edinburgh, and entered the shale oil industry. His first gas managership was at Auchterarder (1896–99), and from there he went to Carnoustie (1899–1902). He was appointed to Alloa in 1902. In 1906 he was Chairman of an informal meeting of gas managers and Convenor of informal meetings from 1912–20. He originated the Scottish Gas Council—a forerunner of the National Gas Council—and held the position of Secretary of the Scottish Management Committee of the N.G.C. and of the Federation of Gas Employers, being also Secretary of the Scottish Tar Board and Hon. Secretary of the British Commercial Gas Association (Scotland). In 1937 he was presented by the National Gas Organizations (Scotland) with his portrait in oils "in appreciation of services rendered as Hon. Secretary, 1919–35." He is a Fellow of the Chemical Society, a member of the Society of Chemical Industry, a member of the Institution of Chemical Engineers, and a Fellow of the Royal Society of Arts, Edinburgh. Mr. Napier's services have been eagerly acquired in arbitration cases for transfers of gas-works to local authorities and investigations into schemes of gas supply in Scotland.

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Evesham Town Council have approved the appointment of Mr. C. H. EDWARDS as Gas Engineer and Manager. He succeeds the late Mr. P. H. Fletcher.

Mr. H. MILLINGTON, of Mossley, Lancs, has been appointed Assistant Engineer and Manager.

* * *

Mr. W. J. SHELLEY, Engineer and Manager of Thornton Cleveleys Gas-Works, has resigned his appointment to take up a Government position.

Obituary

The death has taken place at the age of 71 of Mr. T. A. NICHOLLS, who was Secretary of the Cannock and District Gas Company, Ltd., for about 35 years.

Letters to the Editor

Gas Rationing by Tokens

SIR,—Fuel rationing has been postponed, but the country has been told that the "points" system is being kept ready for use when necessary. Must we in the Gas Industry accept "points" as the last word in rationing technique, or may we, in the breathing space afforded by the postponement, see if there is any alternative to a scheme that is admittedly open to criticism?

Apart from wider interests in the Gas Industry, I preside over a small market town gas company, and I have worked out a scheme that I am convinced could be employed successfully in that area, and with adjustments it could be adapted to any other undertaking, large or small.

Assuming it is required to reduce consumption by 12½% the scheme would work out roughly as follows, taking the prepayment consumers first:

Consumptions and cash in the four quarters ended, say, Mar. 31, 1942, would be recorded for each prepayment meter consumer on a slip and set against each quarter, and the amounts shown, less one-eighth, would be the ration for the quarters to follow. Payment would be, not by coins, but by specially made plastic or metal tokens to the appropriate amount, purchasable from the collector or as required on production of the ration slip from approved local dealers. Any evasion of the method could, of course, be dealt with under existing rationing regulations. At the end of each quarter the collector could sell back an appropriate number of discs to the consumer for cash—a true prepayment system involving no risk of loss through tampering.

Ordinary consumers would be given their comparative figures and warned that the reduced amounts must not be exceeded, except under a penalty of, say, double rate for the excess (the excess payments being devoted to the war effort). If excess consumption continued to the end of a second quarter, the ordinary meter could be compulsorily replaced by a token meter.

During the last year movement of the population on the whole has not been abnormal, and economy has been generally studied, so that it would not be very wide of the mark to base rationing on the past four quarters. Cases of hardship could be dealt with by one or other of the Citizens' Councils or Tribunals on which, say, once a month, a member of the fuel supply undertaking could be co-opted. A more direct check might be achieved by slightly closing the coin slots to take a smaller token disc than the equivalent coin, a process no more difficult than normal price changing.

Compared with the cost of extra staff and the tons of paper needed for the "points" scheme, the cost of the tokens would be negligible and the first cost would be to a large extent the only one. Labour and materials in the plastics industry do not present great difficulties, owing to simplicity in manufacture and type of material. If preferred, the tokens could be of standard coin size; their illegitimate use for other purposes would be unlikely because automatic machine buying is on a much reduced scale, gas tokens would be more valuable than coins of the same size, and it would be a punishable offence to misuse them.

An all-round saving would be ensured if token metering were continued after the war. In Holland, where it has been practised for years, it has worked well, not the least reason being the enormous saving by preventing cash pilfering and damage to coin boxes. Token metering has the advantage that it is entirely a "cash before delivery" business and no money lies about in boxes awaiting collection.

Yours faithfully,

London, S.W. 1. "TOKEN."

A Gas Training College

DEAR SIR,—In view of the attention which is being given to post-war planning, may I be permitted to make a suggestion to the Gas Industry which would undoubtedly make for a considerable improvement in training and refresher facilities for gas utility personnel.

My proposal is for the establishment of a Gas Industry Training College, complete with hostel facilities, on the lines of the Post-Office Engineering Service College at Dollis Hill, London, and the L.M.S. Railway School of Transport at Derby.

The utility of this type of college for the training of gas-works (manufacturing and engineering) personnel is a subject upon which I am not qualified to offer an opinion, but for the instruction and training of district personnel I can visualize that such an institution would be of the highest value to the Industry. Many training and refresher courses could be arranged, and among other things a determined attempt should be made to impress upon the minds of the trainees the basic economic value of the Gas Industry to the community.

This aspect of Gas Industry service is one which usually receives inadequate consideration, whereas a correct understanding of this problem at once gives a national character to our outlook and service, irrespective of the size of the undertaking in which we are employed.

There are at least 40,000 persons normally employed in the distribution and sales activities of the British Gas Industry, which means that, taking an average working life of 40 years, there is an annual entry to the distribution side of 1,000 persons. Each of these men represents a capital investment of approximately £5,000 and a load factor of 8 million cu.ft. Therefore I suggest that it is sound policy to protect both capital and load by providing adequate and comprehensive training.

In my view, great as our system of technical education has been in the past, it will be totally incapable (without very drastic reform) of rising to the post-war demand for whole-time, part-time, and evening instruction in technical subjects. Therefore it must be obvious that the limited available capacity of educational establishments will be almost entirely devoted to the teaching of academic subjects ancillary to trade technology, thus leaving industry to make its own arrangements for trade instruction.

The Gas Industry must not lag behind in its appreciation of this problem. We are a large Industry, but widely dispersed; hence the need for residential college facilities.

332, Duffield Road, Yours faithfully,
Darley Abbey, THOMAS SMITH.
Derby.
July 2, 1942.

1942 "Journal" Directory

The following changes should be noted in order to keep the Directory up to date:

Page 66. STOURPORT. F. H. Greenway (Chard), *M.*, *vice* A. S. Foster, resigned.
„ 66. STROUD. F. B. Waller, *E. & M.*, *vice* T. H. Woodcock, retired.
„ 84. DUNDEE. J. Dickson, *E. & M.*, *vice* J. Wilson, deceased.

Meetings of the London and Counties Coke Association will be held as follows on Monday, July 20, at Gas Industry House: Finance Committee, 10.30 a.m.; Executive Committee, 11.15 a.m.; Central Committee, 1.30 p.m.

The Director-General in Wales

Formulation of Gas Industry Opinion

The Director-General of Gas Supply, Dr. E. W. Smith, was given a hearty welcome when he visited Cardiff on July 2 to talk informally to members of the Wales and Monmouthshire Association of Gas Engineers on the needs of the Industry. The meeting was well attended, and there was free discussion following Dr. Smith's inspiring and helpful Address. Mr. J. F. Rust, of Newport, was in the Chair.

Dr. Smith made it clear that the Gas Industry must face radical changes. The changes should be of an evolutionary not of a revolutionary nature, and the weight of Industry opinion needed to effect reorganization smoothly must be solid and unanimous—and, above all, the opinion must be formed from within its ranks. That the Industry has suffered neglect, he continued, is the Industry's own fault. The attitude taken up was to maintain independence as small working units, the while seeking favours. This attitude was quite absurd to-day, and the aim should be to give more than it was anticipated would be received. Granted this new vision, the Industry has a great future; on all sides there was ample confirmation of the value of gas in industry and the home. If those in the Industry work as a team, with the pervading thought that gas is a public service, we can look confidently to success.

Interworking is essential and so is adaptability; a readiness to assist the other man must prevail; tolerance should be exercised throughout; mutual help should be the order of the day—a willingness to give and equally a willingness to receive. Responsibility should be welcomed in the common interest.

Greater thought could be given to everyday working and it would yield fruitful results. Take the use of gas industrially. The need for fuel economy needs no stressing; if due thought were given to the matter by everybody concerned, from the gas official to the individual industrial operative, a saving of anything from 10 to 20% could be made in industrial gas consumption in every district and with existing gas-using equipment. Hence the need for regular and consistent visits to works to offer advice. This is an important phase of the Industry's present tasks, and it simply must be tackled in the right way in a a spirit of friendliness and with proper appreciation of the other man's point of view, circumstances, and difficulties. The Directorate of Gas Supply is endeavouring to play its full part. Appointment has been made of a small number of industrial gas co-ordinators to act in an advisory capacity and in harmony with gas engineers and industrialists in their areas—a service at the disposal of the Industry in general.

Dr. Smith had a word to say about mutual aid schemes on the lines of the scheme established by the Midland Association ("JOURNAL" of April 8, 1942). He gave his unqualified blessing to such schemes, which can be designed to meet the particular requirements of particular districts though having a common principle. The Director-General also spoke of the need for clear thinking and complete candour in analyzing and discussing problems. Regionalization of supply and regional control will come, but the initiative and definition must arise among themselves in their own areas. Working to an agreed plan, with the driving force emanating from the districts, individuals need have no fear as to their future usefulness and future prospects.

Mr. W. T. Kenshole, Merthyr Tydfil, looking to the immediate future wondered what will be the attitude of the Ministry of Fuel to the Gas Industry's suggestions and aspirations. He agreed entirely with the need for regional working, mentioning how conditions differ from region to region. In South Wales, for instance, there is "free coal" for mineworkers. Normally in Merthyr gas consumption per consumer was about 9,000 cu.ft. a year, because of this "free coal." If he supplied consumers with free gas cookers he doubts whether they would be used. How will the Ministry of Fuel regard the matter, and what will be its policy concerning the burning of raw coal? And to what ought we to look forward—an all-gas era of complete gasification or a gas-cum-coke era? Will the policy be based on the processing of coal at large strategic plants, maybe at the pit head?

Dr. Smith said that without doubt the movement was in the direction of coal processing, but that it would take time entirely to replace raw coal in the open grate. Complete gasification would be applied in as far as it proved an economic proposition, but immediate steps could be taken to supplant raw coal by smokeless solid fuels. Bulk carbonization producing suitable fuels in requisite quantity was likely, and processing at the pit head might well be a logical sequence to regional development. The problem resolved itself finally into a national one, but national organization must be based on information and suggestions collected and put forward regionally. In brief, direction would follow upon local needs and local opinions, which would be sifted, analyzed, co-ordinated, and resolved into unified national policy.

It was with this line of thought that Dr. Smith replied to Mr. R. S. Snelling (Newport), who asked if the Directorate of Gas Supply could not in fact afford a little more direction at the present moment, suggest, as it were, terms of reference, give specific guidance, and define more clearly what it expected and desired from the regions through joint discussion. Dr. Smith said the best and surest way to satisfactory reorganization was for the central authority to seek powers from the known wishes of the regions expressed through their existing organizations and expressed with solid unanimity.

Points of practical procedure were raised by other speakers, to all of whom Dr. Smith replied, giving valuable advice, and the meeting was brought to a close by a vote of thanks to the Director-General, proposed by Mr. Rust, seconded by Mr. A. E. Pask, and warmly accorded.

Development of the Industry

Importance of Consumption per Consumer Figure

Speaking in Leeds on July 3, Mr. E. V. Evans, President of The Institution of Gas Engineers, remarked that important though our contribution to the war effort now is, we must be prepared to serve the nation and the community even more assiduously than ever when the problems of peace have to be faced. He continued:

How often have we said there is nothing like the carbonizing process for dealing economically with the national coal resources. How many of us have proved that if gas, or gas and coke, be used for the complete heating of the domestic house, and the method of charge is a well-planned one, the fuel bill is substantially the same as if raw coal were used. Could any industry want greater encouragement or greater assets than these? Let me develop this theme: The average small house requires about 270 useful therms a year for comfortable heating. In the past our Industry has supplied 20–25% of the total heat required by the domestic consumer by gas and about 5% by coke. If, instead of supplying 60 or 70 therms per consumer per year we supplied 250–300 therms, how mighty our Industry would become. We may well ask ourselves what restricts our development, and I think the main reason is that gas is so expensive that it must be used as a luxury rather than as a necessity. And yet it is only expensive because we have been content to sell it in small quantities, and have failed to make it clear to the consumer that the larger the quantity taken, the cheaper each therm becomes.

We cannot compete in price with raw coal unless gas or gas and coke be used as the sole heating agents. May I make this point a little clearer. It may, I think, be assumed that the average "servicing" cost per consumer per year is about £2 10s. Now this is 600 pence, and thus the servicing charge for 100 therms yearly is 6d. per therm, for 200 therms 3d., and for 300 therms 2d. If the price of gas alone is 4d. per therm, this means that the overall price when 100 therms are used is 6d. + 4d. = 10d. per therm; for 200 therms, 3d. + 4d. = 7d. per therm, and for 300 therms, 2d. + 4d. = 6d. per therm.

It is when gas is sold at 6d. or 7d. a therm, with its general overall efficiency of 50%, that it ceases to be a luxury fuel and can displace raw coal.

Let us consider the other side of the picture—the grim side. If the consumption per consumer falls to 75 therms per annum, the service charge rises to 8d. and the final cost of the therm to 1s.; for 50 therms per consumer per annum the final price is 1s. 4d. And how many consumers take less than 50 therms!

From these latest figures two observations may be made. The first is that we all have a large number of consumers who are not paying adequately for what they receive, and these unremunerative consumers are a bar to our progress. The second observation is that at a price of 1s. 4d. a therm gas heating is a luxury. All these figures show the prime importance of maintaining a high consumption per consumer, and I have no room for the man who says "Consumption per consumer doesn't matter."

One of our main problems will be to induce an increased domestic consumption by the application of a well-planned method of charge. Then, and then only, can gas do the service of all solid fuels at substantially the same price.

Now it will be many years before we are successful in developing our business to the magnitude it deserves to assume, and it will be no simple matter, because appliances using raw coal are from year to year being improved. Those of us who fall into the category of elders in our Industry can do little more than prepare the way. It is our duty to see that the young men coming along are not only aware that an immense scope for development lies before our Industry, but are wholeheartedly enthusiastic—even to the extent that progress with them becomes an obsession.

And this then starts another train of thought—matters that receive the attention of your Institution. The basic education required in our young men and the facilities for their training, and then as a matter of prime importance, the salaries that are to be paid. We must retain in the Industry the efficient men we already have, and be prepared to offer such terms as will induce men of a high order into our ranks.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

Saving Fuel

C.A.M.A. President on Ways and Means

The Government has made it plain that there is a gap between production and consumption of coal which can be closed only at a sacrifice of domestic well-being and industrial output or by economy and efficiency. How to ensure that the second alternative shall prevail was the main point of Mr. William Rennie's Presidential Address at the Seventh Annual Meeting of the Combustion Appliance Makers' Association (Solid Fuel) in London recently, when the fuel situation was deemed of sufficient urgency to call for a departure from the decision reached early in the war to suspend general meetings for the duration. Industrial output is going up, and there can be no question of any actual reduction in consumption; at the same time, with industry working at full strength, there are many factors operating against efficiency. But in Mr. Rennie's view, it is just when technical difficulties are at their worst that the scope for economy is often the greatest, and even if substantial savings cannot be expected in those industries where fuel economy has been rigorously practised for many years, there is room for some increase in efficiency in almost every plant in the country. Small scale industrial consumers using some 60 million tons of coal a year, mainly for steam generation, may be assumed to operate at an average efficiency not exceeding 60%. An increase to 66%, which is technically quite feasible, would represent a 10% reduction in consumption, and adding possible savings among larger consumers a total of 10 million tons a year may well be within the bounds of possibility. These 10 millions will not show themselves in reduced consumption, but in increased industrial output and the effective utilization of grades of coal at present being wasted or used with great difficulty.

It is at this point, said Mr. Rennie, that the rôle of the coal-burning appliance manufacturers acquires decisive importance, and to counteract all the wartime tendencies towards deterioration of plant, he suggested that the Ministry of Fuel should make a broad survey of coal-burning equipment so as to ascertain the most urgent steps which should be taken, and call the appliance makers into consultation to see how best these measures can be applied. Deterioration in coal quality, coupled with the policy which the Government has followed with regard to price, has created difficulties of supply, and it is felt that the position would be greatly eased if the present price structure were revised so that low-grade fuels were not subject to the same flat rate increases as the washed and graded varieties. Another point emphasized by Mr. Rennie was the need for uniformity in successive consignments of coal. The technical problem of rearranging coal supplies to meet an entirely different distribution of markets from that which existed in peace time has been immensely complex, and coal-burning appliances have been called on to burn coals quite different from those originally specified. There has been substantial improvement in this respect during the present year, but Mr. Rennie stressed that quality as well as quantity is needed if industrial output is to be maintained at its highest level.

Raw coal still represents about three-fifths of the total domestic fuel and power consumption—gas and electricity sharing the balance—and, to quote Mr. Rennie literally, "however much we may wish to encourage the use of these two excellent sources of heat and power, it must be clear that the output of these industries cannot possibly grow at a sufficient pace to take over from raw coal within a very considerable number of years." During the past year the C.A.M.A. has helped to form a group for research and development on the improvement of domestic solid fuel burning equipment. Coal, gas, and electricity will probably be more expensive in the future, and the only way to maintain the standard of living to which we have been accustomed, without increasing the cost of domestic services in terms of real earnings, will be by raising efficiency. To this end the Association has joined forces with the coal owners and distributors to explore the possibilities of improving appliances and to settle the best way in which coal can be delivered and used in the home.

The Economics of Coal Blending

We have received from the Author, Mr. William Bennett, A.M.C.T., Engineer and General Manager of the Ashton and Mossley Gas Companies, a copy of a work he has written on "The Economics of Coal Blending in Carbonizing Processes." In this, mathematical reasoning is set out for arriving at formulae for ascertaining the yield of products from blends of coals mixed in any proportion, and by combining prices of coal and residuals, formulae for the most economical blends. He introduces an expression, k, which he terms the "coefficient of digestive carbonization"—a mathematical idea to which the Gas Industry, he maintains, must get accustomed. We quote from his Preface: "When two coals are mixed and subjected to constructive distillation all kinds of changes, chemical and physical, take place, and the presence of one coal with another vitally affects these changes. Not the least of these effects is the effect of plasticity, and plasticity has a great influence in determining final products. k really expresses in a single term the summation of all these influences between any two coals." The price of the work is £5 5s. net.

Cooking Appliances for Wartime Canteens

Three Appendices to the Ministry of Works, "Schedule of Cooking Appliances" have now been published by H.M. Stationery Office. These are: Appendix A—Kitchen Machinery; Appendix B—Tea-making Appliances; Appendix C—Portable Equipment. Government Departments (who, with manufactures, co-operated in producing the appendices) will quote from these schedules when ordering kitchen equipment.

Appendix A—Kitchen Machinery (price 4d.) describes in detail the types of automatic, semi-automatic, and hand-operated machinery used in Government sponsored canteens.

Appendix B—Tea-making Appliances (price 6d.) contains illustrated descriptions of café sets (with boiler above or below counter), water boilers for use with separate urns for bulk tea making, urns, bulk tea makers, &c.

Appendix C—Portable Equipment (price 4d.) is also illustrated. It describes wheeled ranges, food containers, ovens (suitable for use on ranges), cooking stoves, milk or porridge boilers, trolleys, pot racks, &c.

Canteens for War Workers

Firms engaged in organizing and operating canteens under the Factories (Canteens) Order, 1940, in Admiralty supply, aircraft, munitions, and other war equipment factories throughout the country have formed the National Society of Caterers to Industry, with head offices at 83, Pall Mall, London, S.W. 1 (telephone Whitehall 3955). Mr. H. J. R. Stent (Barkers, Contractors, Ltd.) is President of the Society, and other members of the Council are Messrs. H. Gardner (John Gardner, London, Ltd.), D. C. Jenkins (Catering Contractors, Ltd.), A. Hall (K. & A. Hall, Caterers, Ltd.), G. A. F. Layton (Factory Canteens, Ltd.), N. Abrahams (Staff Caterers, Ltd.), H. S. Taylor (Industrial Catering, Ltd.), and J. Bindon Moore (Bindon Moore Co.). Mr. L. W. Slark (John Gardner, London, Ltd.) is treasurer, and Mr. Arthur Lawson, formerly of the Board of Trade, has been appointed secretary.

It is estimated that the factory canteen industry consumes some £500,000 worth of gas and other fuels in the course of a year, and the Society will therefore be much concerned with problems of efficiency of kitchen equipment and the economical use of fuels. It has already been in consultation with the Gas Industry and it is expected to establish useful contact with the appliance manufacturers' organizations who were concerned with the recently issued schedule of "austerity" equipment for war canteens.

A National Joint Industrial Council to secure joint action between employers and employees in the industry has also been formed, with Mr. A. Lawson (for the Society) and Mr. L. H. Pearmaine (Transport and General Workers' Union) as joint secretaries.

B.S. Test Code for Continuous Verticals

The British Standards Institution has just issued a further code in its series of Test Codes, B.S. 1034 Test Code for Continuous Vertical Retorts.

While test codes for carbonization plant may differ widely in their scope owing to inherent differences in the purposes for which they are required, it is deemed essential to have a code which contains all the necessary provisions for the experimental determination of the yields and qualities of the main products, together with full explanations of how these should be measured; excluding, however, reference to data which are not necessary to a general evaluation of the behaviour of a given plant.

The full British Standard Test Code would, however, be too comprehensive for the purpose of checking guarantees as between the contracting parties in the construction of a new plant. When a gas undertaking, therefore, purchases a plant under guarantee there are four main points upon which the undertaking usually requires to be satisfied—viz:

(*a*) That the plant will make a given number of therms per day at a specified calorific value under normal working conditions.

(*b*) That the average calorific value of the gas measured under standard conditions shall be not less than a given figure.

(*c*) That the make of gas per ton of coal (containing a prescribed content of ash and moisture) under the conditions (*a*) and (*b*) shall not be less than a given figure.

(*d*) That the quantity of fuel consumed in the producers per ton of coal shall not exceed a given figure.

The fulfilment of these four obligations is usually accepted as implying that a carbonizing plant has satisfactorily passed its guarantee test. The conditions under which the specified conditions may be obtained with the necessary degree of accuracy are defined in Appendix A.

As in the case of the other test codes, the code is divided into the following sections: Plant performance, data relating to material supplied, data relating to the products—*e.g.*, gas, coke, crude benzole, tar, waste gases, steam, clinker and ashes, carbon balance. It is followed by appendices on guarantees and guarantee tests and method of temperature measurement.

Copies of this specification may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W. 1. Price 3s. 6d. (post free 3s. 10d.).

DISCUSSION ON INSTITUTION PAPERS

THE GAS INDUSTRY IN RELATION TO POST-WAR DOMESTIC ARCHITECTURE

By E. CROWTHER

(*Continued from p. 531, "JOURNAL" of June 24*)

Mr. **L. W. Andrew** (Gas Light & Coke Company): Our old friend 4d. gas has never come out better than in the practical tests quoted in the Paper. It is worth while underlining what 4d. gas has achieved at no increase in the annual fuel bill. It has competed with coal at Newcastle prices, provided the amenities of an automatic clean fuel, and given more useful heat—all using conventional pre-war appliances. The Author's figures for useful therms needed and running costs agree substantially with Table IV in Dr. Hartley's Paper.

I would like to ask Mr. Crowther if he considers that the much discussed potential improvements in solid fuel appliances after the war will alter the position to any marked extent. I think not, but the Industry must take full and early advantage of the proper use of flueless heaters, better designs of convector fire, and low heat capacity water heaters. Also, did Mr. Crowther meet marked opposition in substituting the conventional formal gas fire for the flickering homely coal fire in the living room? Such opposition is surely still strong and affects the largest single heat usage in a house.

There are two small details which seem wrong to me in the lay-out of the proposed all-gas house. First, is it wise to use 12 in. by 2½ in. flues throughout for ventilation purposes? I do not feel that we know enough about ventilation to limit all flues to that size. Why not have at least one flue of, say, 50 sq.in. area for the main living room, bearing in mind that a series of 12 in. by 2½ in. flue blocks may not give an effective area of 30 sq.in.?

Secondly, no provision is made for a flueless heater in the hall. Properly used, such a heater is of the greatest value to the general comfort of a house.

Finally, I would like to underline all Mr. Crowther says about architects. To obtain the best heating and ventiliating services in a house means proper co-operation between architect and fuel utilization experts from the very beginning of the plans of the house. We still know too little about the saving in fuel cost and improved comfort standard obtained with properly insulated houses, pipes, and tanks, comparing this saving with the cost of the insulation. We still know too little about the best method of providing adequate flues. The house of the future could truly be built on a new foundation—technical co-operation in the national interest.

SCIENTIFIC CONTROL IN THE RETORT HOUSE AND ITS CONTRIBUTION TO NATIONAL FUEL ECONOMY

By T. CAMPBELL FINLAYSON

Dr. **S. Pexton** (Gas Light and Coke): Mr. Finlayson's Paper is concerned mainly with retort house control in order to secure economy —*i.e.*, absence of wastage of gas, coal, coke, and the materials of which the plant is constructed. In 1931 we extended benzole recovery to gas from continuous vertical retort installations. In 1934 it was decided to proceed with the installation of West's continuous vertical retorts at Southend. It was also decided at our request to remove the "bell-bottomed steaming chamber" in order to provide secondary air pre-heating flues alongside the bottom of each retort. The object of this change was to enable steaming of the retorts to be reduced without overheating of the bottom ironwork, and so yield gas with a calorific calue of about 530 B.Th.U. per cu.ft. All our West's installations, except one which will be similarly rebuilt next year, have since been converted so as to provide for secondary air pre-heating. An important fact arising out of this alteration in design has been that the coke charged to producers reached a figure as low as 3.3 lb. per therm of gas made.

Our newest installation of Woodall-Duckham retorts at Kensal Green is at the moment under test. In this case, too, there is extensive recuperation by secondary air of waste heat from the bottom of the retort. The fuel charged to the producers is at least as low as the figure quoted above.

It would thus appear that in the modern continuous vertical retort installation, carbonizing even Durham coal, we have attained an efficiency of gas production (1) of at least 65%. This figure does not take credit for about 800 lb. of steam per ton of coal raised in the waste-heat boiler. With a compact gas-works of modern design this quantity of steam is a very large proportion of the whole of the steam required to operate the works at full load.

Turning now to operation rather than design, there are two factors arising out of this Paper to which I should like to draw attention.

(1) The nitrogen content of the air-free coal gas at the governor of an installation of continuous vertical retorts should not exceed about 2 to 3%. The analyses can most conveniently be made by the "Metro" apparatus. If the crude gas at this point contains more nitrogen than stated above, its source should be ascertained with particular reference to the possibility of air leakage into the bottom of the retorts.

(2) The air-free CO_2 content of the waste gases from any flue in which damper settings are normal should not fall below 19%. This test should be made with a Haldane apparatus. The test is made in order to estimate the degree of coal gas leakage into the combustion flues. In a recent series of tests on an installation which was 14 years old—the top half of the retorts having once been reset—42 flues out of 51 complied with the stated condition. In the remaining 9 flues there were varying degrees of coal gas leakage. Having identified the flues where coal gas leakage was pronounced, subsequent tests after patching the retorts showed considerable reduction in coal gas leakage (2).

I am very appreciative of Mr. Finlayson's kindly reference to the conception of hydrocarbon enrichment value (3).

In conclusion, I should like to point out that high thermal efficiencies of gas production are not confined to large works. Medium and small works employ similar retort units and their experience in these matters is of equal importance to that of ourselves.

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(2) HOLLINGS.—*Trans. Inst. Gas Eng.* (1927-28), p. 504. PEXTON.—*Ibid.* (1932-33), 82, p. 713.
(3) PEXTON.—*J. Inst. of Fuel*, April, 1935.

Mr. **M. Sinclair Gaskill** (West's Gas Improvement Company, Ltd.): It might be considered that under existing conditions of shortage of technical staff and difficulty in obtaining certain types of instruments, the system suggested by the Author is a counsel of perfection rather than a practical working proposition. But in every works the fullest use should be made of existing equipment and staff. Even the smallest undertakings have some equipment which, systematically employed, allows of a considerable measure of scientific control. The question to be decided is what is necessary and what is practicable in the case of each particular section of the plant. This question having been solved, control should consist of the systematic taking of a pre-determined number of observations and tests at regular periods. The interpretation and correlation of the data thus obtained, the prompt carrying out of any adjustments indicated, and the preparation of a report showing the essential items in as clear a form as possible should follow—*i.e.*, without unnecessary elaboration or detail.

Further, it is a distinct advantage that all data so obtained shall be compared against a standard. This is perhaps best illustrated by the usual temperature chart which in the case of a large installation may consist of a very considerable number of readings which do not convey a concise idea of conditions and may be actually misleading. A clearer picture may be obtained by stating deviations in the various zones or units from the desired temperatures together with some system of defining the conditions in the combustion chambers—*i.e.*, even heating, local heating, &c. In a similar manner the usual 24-hour chart from a recording pressure or vacuum gauge can be reduced to a simple statement of deviation outside a predetermined range, together with time and duration of such deviation.

The foregoing concerns carbonizing conditions rather than carbonizing results. In this respect it is necessary to know the weight of material entering the plant and the weight or volume of the products. Mr. Finlayson rightly stresses the desirability of equipping all retort houses with means of weighing coal to the bench and coke to the producers. It is to be regretted that so few even among modern installations are so equipped. There should be no difficulty in weighing coal, but the weighing of coke is not so easy.

It is more satisfactory to have one scientifically trained man in sole charge of the plant than to divide this duty among three shift engineers.

In order to ensure that the time of the technical engineer is utilized in the most effective manner, it is suggested that advantage should be taken of the change which during the last 20 years has taken place in the retort house personnel. There is no doubt that developments in carbonizing plant design have led to a change in the type of labour in the retort house. The stoker or, as he may be more correctly designated, plant operator of to-day is in many cases not only interested in his work, but with a little suitable training is capable of carrying out many routine observations and tests, thereby liberating the technical assistant for more important work and giving him the time for the interpretation, &c., of results.

Mr. Finlayson has advocated consideration of the improvement of the conditions for the retort house staff, and to this I would add that the Institution should consider a scheme for the training of such staff, believing that such training is not only practicable but would result

in advantage to the Industry and contribute to the best use of the nation's fuel resources.

Mr. **J. M. Webber** (Croydon): Mr. Finlayson states that "it is the duty of the Gas Industry to ensure that the carbonization process is carried out in such a way that the maximum proportion of the therms contained in coal are converted into gaseous, liquid, and solid products." Would it not be desirable to carry this a little further and say that the therms in the coal should be converted into the maximum yields of the products which are most valuable and needed—*i.e.*, that the optimum results should be obtained according to the circumstances prevailing at the moment. This leads directly to a second possible extension of Mr. Finlayson's most interesting outline of a technical control system for a retort house. He is only dealing with carbonization, and carbonizing results have an enormous effect on the efficiency of a works. I am sure, however, that he would agree that retort house efficiency, while always most important, is not always the only factor in obtaining the best possible use of coal. For example, where external water gas plants are employed, the working of the two plants is so closely related that both must be considered together in planning manufacturing policy. Further, it is surely impossible for a technical assistant to get the most desirable results from any plant without some knowledge of economics and costing as well as purely technical results. As assistant who has a grasp of gas-works economics will not only be able to appreciate the reasons for choosing the targets at which he is told to aim, but will be more valuable to the person who does decide the policy and who should be in close touch with those who have to carry it out.

Mr. Finlayson says that "bad purification practice has thus a direct connexion with national fuel economy." The whole question of the importance of keeping down inerts is extremely interesting and great light is thrown on what has, I think, been a dark subject, by Dr. Pexton's Paper on "Hydrocarbon Enrichment Value," and by Mr. Stewart's recent Paper to the S.A.G.E.M. on "The Implications of a Reduction in Declared Calorific Values." Two points that occur to me are (*a*) although Mr. Finlayson picks out the question of excessive oxygen from purification as an illustration, is it not true that exactly the same remarks apply to nitrogen and carbon-dioxide? Under the conditions he quotes it is very desirable to limit inerts to the absolute minimum. The oxygen percentage is, of course, specially worthy of attention, since unnecessary oxygen added for purification also entails the addition of four times its own value of added nitrogen. (*b*) In the case of the many works which are adding blue gas, carburetted water gas, or producer gas made externally to the retorts, while it may be as important to reduce inerts, to the absolute minimum, the benefit will not be shown so directly as an increase in therms/ton of coal as usually calculated. The effect of inerts is to cause a considerable reduction in the amount of steam which can be employed to bring down the coal gas to the declared C.V. This reduction obviously means a lower yield of therms per ton (not true coal gas therms, but blue gas therms) and a reduction in the presumably desirable conversion of coke into gas. It does not matter, of course, whether this reduction takes place in the retorts or in the external coke gasifying plant, but where external steaming is practised it seems very desirable to make a habit of checking the combined results of the two plants on a coal tonnage basis.

The general insistence on the importance of low inerts raises a large and very interesting question. If the gasification of the relatively small amount of extra coke which is rendered possible by a decrease in inerts is so desirable, then it must have been found profitable to convert coke therms into gaseous therms.

Can we, and should we therefore, think a great deal more (under peacetime conditions) about gasifying more of the large amount of coke which we sell in a solid form without a twinge of regret? There is another side, however, to this question of gasifying as much coke per ton of coal as possible. It is not enough to prove that it is better to sell coke in the gaseous than in the solid form, for the cost of this B.W.G. therm so obtained has then to be compared with the cost of the coal gas therm which might have been made in its stead.

Mr. **H. S. Milne** (Aberdeen): It is advantageous to make provision for the convenient removal from the carbonizing plant of accumulations of flue dust, as such accumulations may only become apparent when the efficiency of the plant has fallen to such a degree as seriously to affect results. Easily accessible dust doors and chutes, combined with a systematic routine of cleaning will, however, ensure that the presence of dust will not go unobserved for long.

Although the pressure conditions in the foul main are in general carefully controlled, frequently insufficient attention is paid to the balancing of conditions in individual retorts, and as these may vary from retort to retort, depending on the smoothness or otherwise of the coal travel and their position relative to the foul main, such control would appear to be clearly necessary.

To my mind the initial contribution to fuel economy lies with the gas engineer when considering extensions or renewals, and is dependent on the subdivision of his carbonizing plant into units of a convenient size, so as to avoid the necessity of keeping a large installation under fire when only perhaps 50% of the retorts are required for gas-making. By such an arrangement it should be possible for each installation to work at or about full load and by careful attention to heating up and letting down, to reduce very materially the maintenance cost of the setting and the risk of development of faults resulting in leakage and air infiltration. At the same time the cost of maintenance and repairs can be spread more uniformly, while the difficulties often experienced when a large installation falls due for a major repair will be largely avoided.

For an undertaking producing around 8 million cu.ft. of gas per day over a winter period and using vertical retorts only, it would be desirable to have installations with a maximum output of 2 to 2½ million cu.ft. per day and made up of the larger sizes of retorts, together with an additional plant of about half that size built in firebrick in order to give increased flexibility in operation.

Mr. **George Helps** (Nuneaton): The title of this Paper is "Scientific Control in the Retort House." Well, I have no retort house. I scrapped it twelve years ago and you will scrap yours before another twelve years have elapsed. The days of the retort house are finished. What we want is complete gasification. One speaker stated that the nitrogen content of air-free coal gas should be 2–3%. I have 48% of nitrogen in the gas I supply, and I consider this a great advantage. Vertical retort gas contains 54% of hydrogen; I would rather have nitrogen. The coal I use gives a gas containing only 5 grains of sulphur per 100 cu.ft., and I can burn this gas without noise and without odour in appliances which give 100% heat to the room. The Gas Industry's practice is to take 50 or 60% of the coal carbonized and produce coke from it—10 cwt. or thereabouts of coke for each ton of coal. The coal costs, say, 17s. or 18s., and the coke is sold at, say, 37s. a ton. Every consumer could have for the same money twice as much gas as he is now getting, if that gas had a quality of 180 to 200 B.Th.U., which is better than 500 B.Th.U. I ask you to come to Nuneaton to see what this gas can do—and then talk about it. The Gas Industry makes 80 therms of gas per ton of coal carbonized and sells at 1s. per therm, making £4, and charges the consumer for the coke sold.

Mr. **S. K. Hawthorne** (Birmingham): In a continuous vertical retort installation two fundamental requirements for good results are correct and uniform heats and uniform coal travel in every retort. These conditions are not always easy to maintain. Producer gas varies in quantity and quality during fire cleaning periods, with a consequent adverse affect on combustion chamber temperatures. This is particularly the case where settings are heated by an external battery of producers and fire cleaning covers perhaps one hour in every two or four hours. As each fire is cleaned its steam-jet blower has to be turned off, and there is a pressure drop in the producer gas main. On one large range of retorts in Birmingham we have endeavoured to counter this producer gas pressure variation by installing an Arca control on the steam supply to the venturis. Thus, when the steam is turned off one producer it is automatically increased on the others to maintain a constant producer gas pressure. This arrangement has been in operation for five years and has proved of considerable benefit.

With regard to coal travel, the Author recommends indicators on the auxiliary coal bunkers. These are undoubtedly of great value if intelligently used. Actually, the best possible guide to uniform coal travel is the temperature of the offtake gas, but it is rather impracticable to have thermometers in every offtake. It is very instructive to fix a recording thermometer on a single retort offtake, and note the sudden and wide temperature variations which occur when a retort is working badly. It might be possible to devise a rough temperature indicator for attachment to offtakes.

With regard to coke extraction, some small variation between retorts inevitably occurs, and it is important to check up extractor speeds frequently and attend to slow retorts. We have attached a simple type of indicator to each extractor on one range of retorts by which the number of revolutions performed per 24 hours is seen at a glance.

The control of calorific value on continuous verticals, particularly with varying coals, is not simply a matter of steam pressure adjustment. There is an optimum amount of steam, for a given throughput, above which calorific value may rise due to lowering of retort temperatures and reduced steam decomposition—in fact, the same calorific value on the same type of coal can be obtained with widely differing steam pressures, one above and the other below the optimum. In certain circumstances a decrease in calorific value is obtained by reducing steam. Only the experience of the man in control of the retort house, together with a knowledge of the conditions prevailing, can determine what action is to be taken when adjustments of calorific value are necessary.

Mr. Finlayson emphasizes the value of a test stream by which various actions can be independently tested. At Windsor Street Works in Birmingham we have such a test plant capable of taking units up to 3 million cu.ft. per day from a retort house making 25 million cu.ft. per day. This has proved invaluable in keeping all sections up to scratch, and in determining the best conditions for different coals. With such a plant, close and continuous technical supervision is absolutely necessary.

With regard to amenities for the workers, which the Author mentions in his conclusion, there is no doubt that a great deal more attention will have to be paid to this matter in the future. Probably the most arduous jobs in the retort house are those of fire cleaning and flue cleaning, and incidentally both these operations are difficult to supervise. I believe that in large installations at any rate it might be of benefit to introduce external mechanical producers, and thereby deliver clean producer gas to the retort settings. This arrangement would undoubtedly involve considerably higher initial cost, and would

necessitate the cooling of the producer gas with loss of its sensible heat and subsequent reheating before entering the setting. Theoretically, fuel consumption would be a little higher, but in my view the uniformity of quality of producer gas, the absence of dust, and the lower amount of combustible matter in the ashes would outweigh the disadvantages. The installation of such producers would eliminate flue cleaning, enable uniform temperatures to be more easily maintained, eliminate attack of flue dust on refractories, and almost certainly give a longer life of settings between repairs. Incidentally, a setting so heated would be more amenable to scientific control.

There has been a tendency in recent years to cram maximum carbonizing capacity in minimum space for the lowest initial expenditure. Such design is against comfortable working conditions, and efficient maintenance, particularly hot repairs to brickwork and ironwork; it also discourages the close control and frequent adjustments necessary for high efficiency and long life.

Mr. **G. C. Pearson** (Birmingham): I note that Mr. Finlayson recommends control of quality by variations in steaming. For good practice the steam should be increased to produce the maximum efficient steaming reactions within the retorts. The coal throughout should be adjusted to suit these conditions of maximum water gas production, hence a rise in calorific value in these circumstances can only be checked by a decrease in throughput. To obtain these results technical control of the kind mentioned by Mr. Finlayson is required in the Gas Industry.

I should like to see a supply of technical men made available in the various areas to give service to the smaller works. The benefits accruing from such a course are manifest and the wider experience gained by the individuals in this interchange of ideas and training would eventually be to the good of the Industry. Again, while a general lowering of C.V. has taken place in recent years, far too many works are equipped with plant designed to produce, under proper gas-making conditions, a richer gas than the declared value. The lower C.V. can only be made by the addition of inerts as diluents. Such a practice must be accompanied by low thermal efficiency and often leads to serious working difficulties and is bad from a national standpoint.

The gist of many of Mr. Finlayson's statements is that hydrogen and carbon monoxide should be used as diluents and a great proportion of the control mentioned is designed to ensure that end. Therefore, I regard it as fundamental that all gas-works should be equipped with plant designed to produce a proper town gas of the quality declared. This would improve distribution conditions and bring about economy in coal and oil.

I welcome the remarks regarding amenities. Men cannot be expected to perform their best work in uncomfortable and unhealthy conditions. The remarks apply to technical men, retort house personnel, and particularly heat attendants. Money spent on such improvements will always be repaid and plant designers should bear this in mind even at an increase in capital cost. As a specific instance of the foregoing I believe that the space between retort centres has been unduly reduced in many cases, resulting in cramped and uncomfortable working conditions. This is the result of competition in tendering, but it is false economy.

THE DESIGN AND OPERATION OF GAS-FIRED INDUSTRIAL EQUIPMENT IN RELATION TO NATIONAL ECONOMY

By Dr. E. A. C. CHAMBERLAIN

Mr. **D. C. Gunn** (Yorkshire Industrial Gas Centre): Dr. Chamberlain has discussed very clearly the meaning of "efficiency" in furnace operation. He states that the real criterion is not percentage efficiency, but heat input per unit of throughput. I should like to enquire what meaning the criterion "units of throughput per unit of heat input per unit time" would convey, and whether this does not cover both economy and productive capacity?

The Yorkshire Centre has for some time past been engaged on research into the economy of furnaces, and quite recently a series of experiments has been completed, the results of which might be considered of interest. Two pit type furnaces of approximately the same capacity were installed side by side. Furnace A was of orthodox design with no heat salvage. Furnace B was of a special design incorporating a highly permeable lining through which the products of combustion were exhausted into an annulus between the permeable lining and the insulating course. After a large number of tests on the furnaces the following results were obtained:

(1) Melting aluminium in crucibles—Furnace B shows economy of 24%.

(2) Maintaining 1,400°C. empty. Furnace B shows a net economy of 51·6%.

During this test the waste gas temperature of Furnace A was 1,600°C., while on Furnace B it was only 875°C., the difference between the heat contents in the two cases being made to perform useful work n reducing heat loss through the structure.

(3) Initial rate of heating of Furnace B is very great, colour over all the wall surface being evident in less than five minutes from heating up.

The savings are of the same order as those obtainable by recuperation and regeneration, and the degree of complication involved in building a furnace is not so great. It is not much more than the difference between building a house with a cavity wall instead of a solid wall. The permeable materials which might be used include the following: Specially permeable insulating refractory material with tongued and grooved joints, sintered sillimanite, fused alumina and zircon.

It will be noticed that the principle bears something in common with "surface combustion," although the flow is reversed. It is possible that some of the phenomena associated with surface combustion are present in this case also. Many of the difficulties envisaged during the first stages have not materialized. Although worked in an atmosphere which is certainly not clean, the pores of the lining have not clogged up. It may, however, be desirable to use an exhaust fan, and careful attention must be given to the sealing of the door lid. The furnace design is patented, and it is hoped to obtain a number of installations of high speed steel furnaces where a saving of at least 40% appears possible.

The experiments have been carried out at the University of Leeds and are proceeding. It is hoped that this technique will enable very high temperatures to be obtained quite easily, and with very great economy compared with present methods.

Mr. **Dean Chandler** (South Metropolitan Gas Company): It is to the credit of the Gas Light and Coke Company that their experience has been passed on through the Industrial Gas Centres Committee Report D.032 to the others in the Gas Industry engaged on similar work. Dr. Chamberlain has summarized the ways of economizing, but I think he is preaching to the converted, so far as the industrial gas engineer is concerned and very few others in the Industry have any active interest. He has indicated the tests of economy of furnace operation, but are not these the everyday tools of the industrial gas engineer? He has himself made clear the present impossibility of extending among furnace operators the specialized knowledge which enables them to keep a continuous check on furnace thermal efficiency, and, again, as he very rightly points out, to the really knowledgeable man thermal efficiency may be a factor of quite secondary importance.

It is one thing to carry out a flue gas analysis test and read the flue oss from charts and quite another thing to get the resulting high figure into proper perspective. It does not necessarily worry the industrial gas engineer that during the working period of carburizing at 950°C. two-thirds of the heat input goes up the flue, one-sixth goes in radiation and convection and only one-sixth goes into heating the steel being treated. I remember being rather pleased at designing a furnace that gave this satisfactory result without undue complication or massiveness. One does not want to see all and sundry taking Orsat analyses of furnace flue gases, since these are of little importance in themselves in the majority of cases. It is the practical application of their skilled interpretation which matters, and lacking experience in such interpretation, furnace hand, foreman, or works engineer may do more harm than good.

Load factor on the furnace may be of much greater importance than thermal efficiency, as Dr. Chamberlain stresses, and it is the province of the manufacturer's staff to deal with this aspect of the problem. It is the conjunction of the two sets of specialized knowledge which will effect the greatest economy and not the well-intentioned, but sometimes unfortunate, attempts on either side to do the other's job. In pointing this out and, incidentally, in throwing some light on one side of the industrial gas engineer's work, Dr. Chamberlain has done a useful service. I think the industrial gas engineer deserves rather more recognition for a lot of skilled but unobtrusive work, and I know that the more his work is recognized by practical co-operation, the happier he will be and the greater will be his opportunities for usefulness.

So far as details are concerned there is little to discuss, but I would like to put forward a rather less rigid method for determining the flue loss with incomplete combustion. The method described by Dr. Chamberlain is neat, but it assumes that the flue gas constituents are only CO_2, CO, H_2, and N_2, but this need not be the case. Oxygen may be present as well, and this means the calculation of an air-free constitution before the method can be applied. I think it is simpler to calculate directly the volumes of CO_2, CO, O_2, H_2, H_2O, and N_2, and then to read from a "Heat Content above 60°F." chart the heat which each of these quantities is carrying away at the flue gas temperature. To the total of these amounts is added the heat undeveloped by the incomplete combustion of CO and H_2. The "Heat Content above 60°F." chart is conveniently included in the American Gas Association publication *Combustion* (third edition, p. 52), or the Association's *Fuel Flue Gases* (p. 60). This method I am suggesting has greater flexibility and actually takes much less time to work than to explain.

As one on the inside, so to speak, I can testify that the excellent work which has been accomplished by the Industrial Gas Centres in all parts of the country in the development and proper use of gas in industry cannot be too highly praised, and I will go so far as to say that what has been achieved by the Centres in the past few years has in no small measure contributed to the smooth work of munitions production.

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THE CONTRIBUTION OF THE GAS INDUSTRY IN THE DOMESTIC FIELD TO NATIONAL FUEL ECONOMY

By Dr. HAROLD HARTLEY

Mr. C. A. **Masterman** (Gas Light & Coke Company): Our main or only post-war asset nationally will be coal. This Paper is about its proper use as a domestic fuel. It shows that, used raw, it is more expensive than coke. If allowance is made for the national costs of smoke and of wastage by inefficiency of our coal capital it is also more expensive than gas. Further, if gas fires were properly designed for living-room use they could then compete on gas at 7d. a therm. In fact, the domestic use of raw coal in new houses has only the support of sentiment and should be recognized as socially intolerable. For similar reasons its use for traction was abolished on the Underground over 30 years ago. As between coke and gas we need more facts from actual use. I think Dr. Hartley flatters coke.

At home, pre-war, I substituted gas for solid fuel for water heating at about the same running cost. Later I saved about 30% by turning off at night. I now save still more by operating only as required, and could do even better on an instantaneous set. Service would be inferior on solid fuel. We don't have tepid water.

I doubt if the Author has made sufficient allowance for these savings made possible by the flexibility of gas. He infers nearly 600 therms in an all-gas house to match up with 4½ tons in an all-coke house. This tonnage will give a poor service. Allowing for various savings on fuel storage, flues, &c., there is price parity with 400 therms which I think might give better value where economy is paramount.

But for some time ahead the gas-works will produce both fuels, and our national housing policy must allow for this. It is for us as producers of both to indicate where gas and where coke have special advantages and how the supply position favours one or the other where both are equally suitable.

If post-war housing were planned exclusively in terms of gas and coke, a quarter of a million new houses every year would alone increase our output by 5% per annum. The introduction of new techniques to increase our production flexibility between coke and gas may be important, but cannot affect immediate housing policy.

So far I have left out electricity. It is the Rolls Royce of fuels which, to be honest, we should prefer to any other for most heating purposes—if we could afford it. We really must try to understand its special position, and drop mutual "assault and battery." I see no way in which it could accept any great proportion of the domestic load at competitive prices; but it has a large off-peak capacity which in the interest of the community ought to be used. Have we no suggestions about this? Do we expect, or wish, to abolish the electrical industry? By resisting its development we have suffered where it hurts us most—the cooking load. Surely we can co-operate in a national plan based on true costs of supply. Flat rates and promotional tariffs have no such reality and can lead to no significant long-term conclusions. It is these we require. If we could find means to absorb in the domestic field the whole electrical off-peak capacity, there would still remain a potential demand for more than double our pre-war gas and coke domestic output.

Dr. Hartley infers the ball is at our feet and that hitherto we have been shirking our national responsibilities. I think he is right. The facts all point to ourselves as the main suppliers of domestic fuel. It follows that we should fit ourselves now for that job. The post-war period will be a time of international crisis and readjustment, of fundamental changes in our social and industrial structure. If our national fuel policy is not to be a patchwork of improvization it must be created and understood before we are swept into that period of confusion and unheaval.

Mr. **J. G. Bennett** (British Coal Utilization Research Association): I have at more than one meeting of the Institution urged that the gas, electrical, and coal industries should get together and get out agreed figures as to the technical position of the three main sources of domestic fuel and power which would serve as a guide not only to the industries themselves, but also to the Government, to local authorities and to private builders. Dr. Hartley has in this Paper given us a most satisfactory basis for such an agreed statement. There is not one of his figures which, speaking on behalf of the coal industry, I would wish to dispute.

I take it that the Paper was written some months ago—that is, before Sir William Beveridge published his estimate of the amount of coal which goes directly or immediately into domestic use. The figure is 80 million tons, which I think came as a surprise to everyone. It certainly did to me. I myself, six months ago, estimated a total of 55 million tons going to the domestic market, but from data which are now available as to the so-called coal merchant's disposals, it is clear that the Annual Reports of the Secretary for Mines, in which a figure of 35 million tons has been given under this head, have been very much below the mark. In fact, they are probably 10 million tons short, and may be even more. I have found it quite impossible to arrive at the total of 80 million tons estimated by Sir William Beveridge, but I think that we have to increase our own estimates to something between 65 and 70 million tons. We must, however, recognize that there may be differences in what we mean by the domestic market. The Mines Department includes in the domestic uses of coal domestic industries, such as bakeries and the catering trade, and also the use of fuel for central heating and by the armed forces of the Crown. Dr. Hartley, on the other hand, specifically refers to household uses. I think that this may account for 5 million tons of the discrepancy between the totals.

In any case, it is clear that the amount of coal used for household purposes is far greater than we have supposed, and this raises even more acutely the question put up by Dr. Hartley as to the extent and the speed of possible displacement of coal by smokeless fuels. It is quite obvious that the gas and electrical industries have an immense field for expansion in the domestic market, and few people will dispute that such expansion is in the national interest. There is one factor in favour of such expansion with which Dr. Hartley does not deal in his Paper and on which I think an authoritative statement from the Gas Industry would be of great value. I refer to the effect on the price of gas of a great increase in the domestic load. In view of the high proportion of the cost of gas which is due to capital charges and distribution, I presume that a very great increase in the load—and by this I mean double the present consumption of gas, or more—would result in a very considerable reduction in cost. It seems to me that this is important in view of the figures given in Table IV of Dr. Hartley's Paper. It must be clear to all of us that the price of coal will rise and any reduction in the consumption of house coal will cause a more than proportionate increase in the price of industrial fuels. This will be clear if you consider that house coal contributes a much higher proportion of the miners' wages than do industrial fuels, and if the market for house coal is reduced it will be necessary to install expensive breaking and screening plant to produce the fuels required for modern carbonization plant. I mention this specifically as the coal industry cannot possibly supply coal suitable for horizontal retorts hitherto recognized as the best for gas manufacture in the quantities required for an enormous expansion of the industry. For this and many other reasons it seems to me highly desirable that we should make an objective study of the mutual impact of the developments Dr. Hartley has foreshadowed on the coal and gas industries. With the example of his Paper before us, I think we need have no fear that an agreed analysis could be made.

I note with interest the important position occupied by coke in arriving at the most economic combinations for domestic heat services. Shortly before the outbreak of war, the Coal Utilization Council made a survey of the methods of heating and cooking used in working and middle-class families in typical industrial and residential towns. The striking feature of this survey was the remarkable extent to which households made use of all three sources of energy—gas, electricity, and solid fuel. It was found that where houses were provided with one or even two alternative methods, the householder would nearly always, at his own expense, make provision for the third. It seems that this may well be advantageous, especially where there is a marked difference between the winter and summer requirements. I know that it is the view of the electrical Industry that the use of solid fuel should be encouraged in so-called "all-electric" houses, in order to help in carrying peak loads during the critical winter periods. It would be of interest to know the views of the Gas Industry on this point.

I entirely agree with Dr. Hartley's conclusion that the accelerated displacement of bituminous coal is a matter that calls for amicable arrangements with the coal interests. Such displacement should be in no way regarded as undesirable from the point of view of the coal industry itself. On the contrary, the strengthening of the economic position of the country which will result from a great expansion of the carbonization industry cannot but be to the advantage of the basic fuel industry. I do not mean by this that the coal industry should itself neglect research and development to improve the domestic use of bituminous coal. As Dr. Hartley says, it will be many years before bituminous coal can, in any circumstances, be displaced, and if the figure of 45 million tons per annum be correct, very large quantities of coal will continue to be used for at least a generation. It is, therefore, imperative in the interests of national economy, of smoke abatement, and of domestic convenience that coal should be used efficiently in the home. Much is being done in this direction. For example, with coal fires using the convector principle, efficiencies more than double those which have hitherto been quoted can be obtained. This, in turn, will put the Gas Industry on its mettle to improve the performance of gas-fired space heaters. Coal-fired cookers can probably be made at least twice as efficient as they are now. When combined with hot-water supply, the coal-fired cooker can show quite a strong case.

(*To be continued*)

A Pamphlet—"Factory Ventilation in the Black-out" (Form 301)—was issued in the early part of the war and has now been re-issued in a slightly revised form by the Factory Department of the Ministry of Labour and National Service. The pamphlet describes briefly the various measures which can be taken to improve ventilation without permitting the escape of interior artificial light, such as mechanical ventilation, provision of light-trap ventilators, and stimulation of air movement. A number of drawings are included showing simple ideas for the construction of light-traps at ventilator openings, such as windows and other wall and roof openings. Copies of the pamphlet may be purchased from H.M. Stationery Office, price 3d. (4d. by post).

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Gas Products Prices

The London Market July 6.

The only change in the prices of Coal Tar Products in the London Market refers to 95/160 Solvent Naphtha, which is now about 2s. 3d. to 2s. 7d. per gallon.

The Provinces July 6.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 10d., pure, 2s. 5d. (controlled by the Control of Toluene No. 2 Order, July 3, 1941, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 1s. to 1s. 4d. according to quality. Solvent naphtha, naked, North, 2s. 2d. to 2s. 6d. Heavy naphtha, North, 1s. 10d. to 1s. 11d. Carbolic acid, 60's, controlled by the Coal Tar Acids Prices (Inland) Order, 1942, operative from May 1. Naphthalene, controlled by the Naphthalene prices (Inland) Order, 1942, dated April 15, 1942, and operative from May 1, 1942, £19 to £19 10s.—bags free. Anthracene, controlled by the Anthracene Prices (Inland) Order, 1942, operative from May 1. Filtered heavy oil (min. gr. 1,080), 7½d. to 8d. Creosote oil has been generally controlled as to direction and price for some time past. Current value—fuel grades 5d. to 5½d; timber preservation and other purposes 4¾d. to 6d. These prices apply as from May 13.

*In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland July 4.

Market continues very active. Refined tar controlled. Value about 4½d. per gallon *ex* Works, naked. Creosote oil: Specification oil, 6¾d. to 7d.; low gravity, 7¼d. to 7½d.; neutral oil, 6¾d. to 7d. per gallon; all *ex* Works in bulk. Cresylic acid finds ready outlets as available. Prices from 3s. 6d. to 5s. per gallon, *ex* Works, naked. Crude naphtha: 6½d. to 7d. Solvent naphtha, 90/160 grade, 2s. to 2s. 3d., and 90/190 Heavy naphtha, 1s. 9d. to 2s. per gallon. Pyridine, 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

Gas Stocks and Shares

Stock Markets on the whole were more or less idle last week awaiting developments in Egypt, although the tone became much brighter towards the close on Friday. The Gas Market was fairly well supported and was not without a few upward price movements. The strongest features were contained in the Supplementary List, where the two Croydon and the North Middlesex preference stocks recorded sharp gains. On the other hand, Gas Light units closed 3d. lower and Imperial Continental, which is nearly always in good demand and until recently on the road to a strong recovery, lost a further 3 points.

The following quotations were changed during the week:

SUPPLEMENTARY LIST

Croydon 4 p.c. Deb. (*x.d.*)	85—90	June 29
East Surrey 5½ p.c. Pref.	95—100	+10
Ditto 6 p.c. Pref.	98—103	+5½
North Middlesex 5 p.c. Pref. ...	90—95	+8
Reading 4 p.c. Deb. (*x.d.*)	90—95	June 29
Romford 4 p.c. Deb.	92—97	+2
Tottenham 5 p.c. Red. Mortgages (*x.d.*)	102—105	July 1

PROVINCIAL EXCHANGES

Derby Cons.	115—120	+3
Ditto 4 p.c. Deb.	95—100	+20
Long Eaton 5 p.c. Deb.	95—100	+8
Sheffield Ord.	124½—126½	+½

OFFICIAL LIST

Alliance & Dublin 4 p.c. Deb. (*x.d.*)	94—99	June 29
Associated Gas & Water Undertakings 4 p.c. Pref.	15/6—17/6	+-/6d.
British 5½ p.c. "B" Pref. (*x.d.*) ...	105—115	June 29
Croydon 5 p.c. Deb. (*x.d.*)	108—113	"
Gas Light Units	12/6—13/6	+-/3d.
Ditto 3 p.c. Deb.	81—86	—1
Imperial Continental	60—65	—3
Mid-Southern "C"	75—80	+2
South-Eastern Gas Corporation ...	14/6—16/6	—-/6d.
South Metropolitan Ord.	56—61	—2
Ditto 3 p.c. Deb. (*x.d.*)	77—82	June 29
Tottenham 4 p.c. Deb.	87—92	+2
United Kingdom Gas Corporation Ord. (*x.d.*)	15/—17/-	June 29
Ditto 4½ p.c. Cum. Pref.	16/6—18/6	+-/6d.

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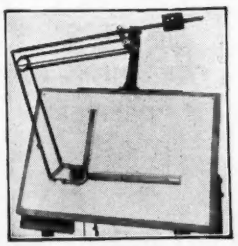

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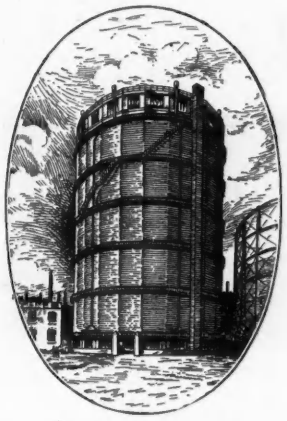

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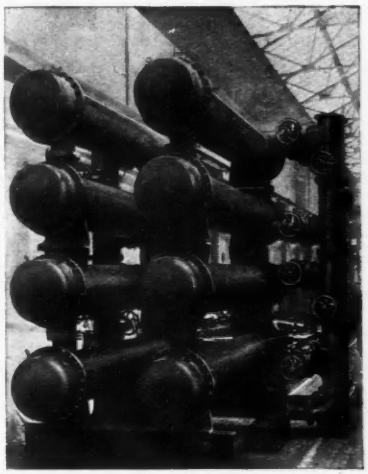

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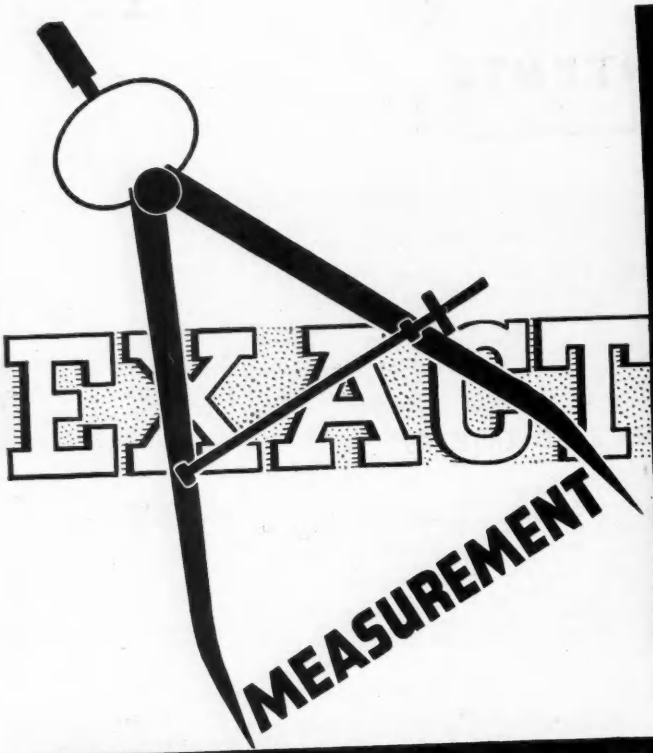

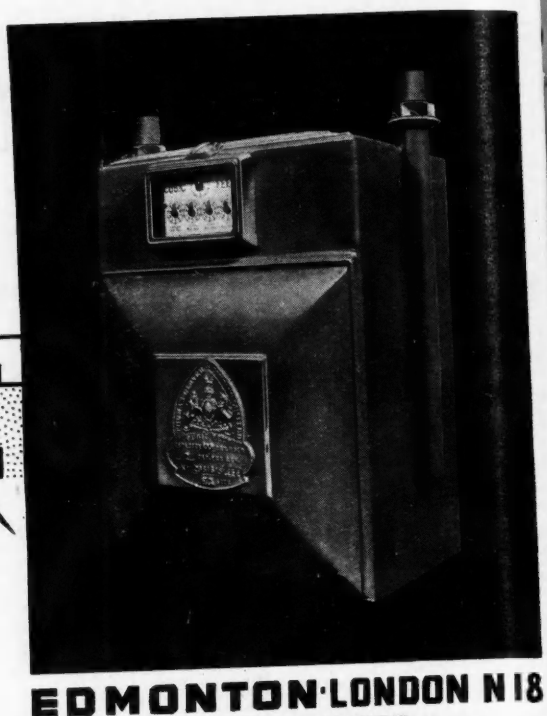

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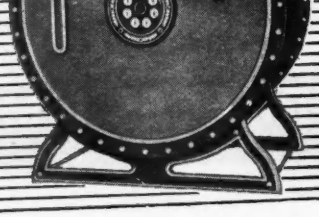

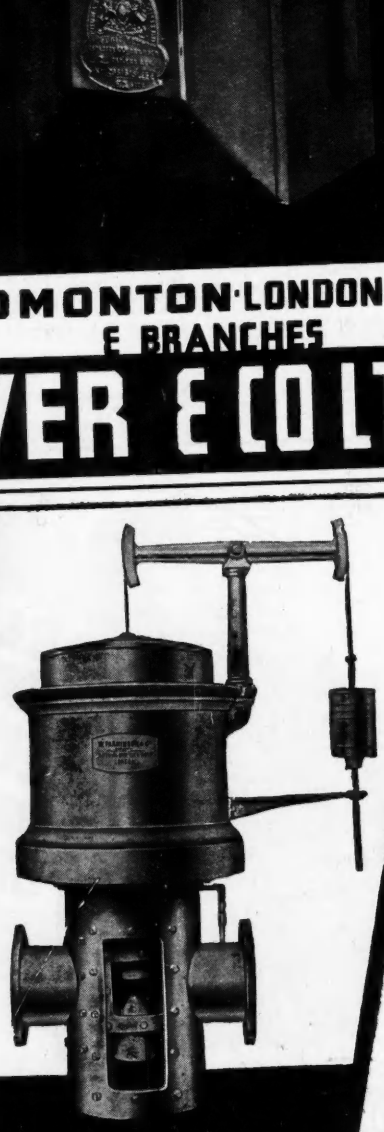

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